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EXAMINER

GAMBETTA, KELLY M

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/615,332
Filing Date: July 08, 2003
Appellant(s): LINDFORS, SVEN

Rabinder N. Narula
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 23 February 2009 appealing from the Office action mailed 15 July 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,126,994	MURAKAMI et al.	10-2000
3,981,156	MODISETTE et al.	09-1976
7,063,981	BONDESTRAM et al.	06-2006
5,376,409	KALOYEROS et al.	12-1994
6,178,925	STURM et al.	01-2001
5,882,416	VAN BUSKIRK et al.	03-1999
6,007,330	GAUTHIER	12-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 12-14, 19-23, 26, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6126994 to Murakami et al. in view of US Patent number 3981156 to Modisette et al. and in further view of US Patent number 7063981 to Bondestram et al.

In claim 12, the applicant claims a method for providing a vapor phase reactant from a solid or liquid source that requires the source being fed from storage chamber into a vaporization chamber maintained at a higher temperature. The source is vaporized in the vaporization chamber, used in a vapor deposition process and the unused source is drained from the vaporization chamber without opening the vaporization chamber. Murakami et al. shows a method where a liquid material L is stored in reservoir 4 and travels into the evaporator 8 in Figure 1. The evaporator and evaporates the liquid material L that travels into the deposition chamber as described in column 2 lines 53-64. The evaporator is heated due to its proximity to heating means 68 and 70 in Figure 1 and in column 5 lines 57-67. Obviously the evaporator would have to be maintained at this higher temperature than that of the storage container, as it

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consistently evaporates material at this higher temperature whereas the storage container does not. Murakami et al. shows a discharge passage 52 that collects unvaporized liquid from the evaporator 8 and is connected to reservoir 4 in Figure 1. Though Murakami et al. does not explicitly disclose the unvaporized liquid flowing from discharge passage 52 into reservoir 4, one of ordinary skill in the art would recognize the utility of connecting a discharge passage from the evaporator into the reservoir, especially given valve VB and line 20, would be to drain unvaporized liquid back into the reservoir that would eventually travel back to the vaporizer. Further, Modisette et al. teaches that one would want to recover vapors in chemical processes and return them to a storage container to prevent the loss of valuable material (column 1 lines 25-30). Though the vaporization of Modisette et al. occurs from a pressurized container naturally, it would be obvious to one of ordinary skill in the art that this recycling of materials also applies to the storage container of Murakami et al. as it is pressurized but adds energy to vaporize the material with liquid left over that will not be used and needs to be recycled to prevent the loss of valuable material. Murakami et al. provides gas passageway 52 that would be used in a process such as the one taught by Modisette et al.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al. to include recycling the unvaporized liquid material back into the storage container and vaporizer as taught by Modisette et al. in order to prevent the loss of valuable material.

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. Murakami et al. and Modisette et al. are described above and include a vapor deposition process for the method previously described. Murakami et al. does not describe this method as an ALD method or supplying pulses of the vaporized precursor alternatingly with another vaporized precursor. Bondestram et al. teaches an ALD system with alternating pulses of two vaporized reactant sources in column 6 lines 17-43 to better control the growth mechanism of the film on the substrate in column 1 lines 21-48. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al. and Modisette et al. to include the method as an ALD method or supplying pulses of the vaporized precursor alternatingly with another vaporized precursor as taught by Bondestram et al. in order to better control the growth mechanism of the film on the substrate. Bondestram et al. additionally describes an ALD method with an inert gas purging in between pulses and a valve for controlling the flow of said gas out of a vaporization chamber in column 6 lines 17-43 and shown by valve 30 in Figure 1.

With regard to claim 13, the liquid materials used by Murakami et al. are described as precursors in column 1 lines 40-51.

Regarding claim 14, an unvaporized liquid is maintained in the vaporizer that maintains the vaporization process in column 5 lines 10-21 and shown in Figure 3.

Regarding claim 19, Murakami et al. shows a pump 62 in Figure 1 is used with discharge passage 52 when it becomes more difficult to remove the unvaporized liquid (column 5 lines 26-40). .

Regarding claim 20, Murakami et al. describes a cold trap 60 in Figure 1 for removing liquid from the exhaust out of discharge passage 52 in column 5 lines 26-40. This can be considered a dedicated drain container for the unvaporized liquid, at least as broadly recited by the applicant in claim 20.

With regard to claim 21, Murakami et al. discloses an apparatus including reservoir that will stably supply the low-pressure liquid material for film deposition (this may be broadly interpreted to include supplying the liquid material stably with respect to temperature) in column 2 lines 28-33. The liquid material L is also said to be under normal temperature and normal pressure in column 3 lines 62-66.

With regard to claim 22, the vaporization chamber keeps the precursor below its boiling pressure, as it does not vaporize the precursor by heat, but by an evaporation gas. (column 4 lines 60-67, column 5 lines 1-9).

With regard to claims 23 and 26, Murakami et al. describes heating means 68 that may be described as a hot zone with the reaction and vaporizer chambers included (at least as broadly described in claim 26) as shown in Figure 1. Heating means 68 includes heaters for the vapor feed passage from the vaporizer chamber to the reaction chamber (at a temperature sufficient) to prevent the evaporated gas from re-liquefying in column 5 lines 57-63.

Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al., Modisette et al. and Bondestram et al. in view of US Patent number 5376409 to Kaloyeros et al. Murakami et al., Modisette et al. and Bondestram

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et al. include a liquid precursor to be vaporized in a vaporizer. Murakami et al., Modisette et al. and Bondestram et al. do not include a solid dissolved in a solvent as a precursor to be vaporized. Kaloyeros et al. teaches the delivery of solid precursors in liquid solution to be vaporized in order to allow low vaporization temperatures of a solid an ease of transportation of the mixture of a precursor and solvent to a chemical vapor deposition reactor in column 3 lines 27-34.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al., Modisette et al. and Bondestram et al. to include vaporizing a solid dissolved in a solvent as taught by Kaloyeros et al. in order to allow low vaporization temperatures of a solid an ease of transportation of the mixture of a precursor and solvent to a chemical vapor deposition reactor.

Claims 17, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al., Modisette et al. and Bondestram et al. in view of Kaloyeros et al. as applied above, and further in view of US Patent number 6178925 to Sturm et al. Murakami et al., Modisette et al., Bondestram et al. and Kaloyeros et al. are described above and include the provisions of claim 17 except for the solid remains of the unvaporized mixture being drained by adding solvent to the vaporization chamber. Sturm et al. teaches a solvent flush approach that flushes the residual solid from a left over in the vaporizer with a solvent in order to dissolve the residual solvent residue and remove it from the vaporizer. (Column 2 lines 28-37)

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It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al., Modisette et al., Bondestram et al. and Kaloyeros et al. to include a solvent flush approach as taught by Sturm et al. in order to dissolve the residual solvent residue and remove it from the vaporizer.

Regarding claims 31 and 32, Sturm et al. discloses the draining in the form of a solvent flush that is performed regularly between each coating cycle in column 2 lines 37-42 or at the end of the day, at the end of the week, or when the wafer is changed in the system in column 6 lines 30-38.

Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al., Modisette et al. and Bondestram et al. in view of US Patent number 5882416 to Van Buskirk et al. Murakami et al., Modisette et al. and Bondestram et al. are described above and include all the provisions of claims 24 and 25 except a vaporization chamber maintained in a first hot zone, a reaction chamber maintained in a second hot zone where the two hot zones share some insulating elements. Van Buskirk et al. teaches heating systems for both the vaporization chamber and reaction chamber that may be one heating system or hot zone sharing insulating elements or separate heating systems or hot zones to prevent condensation of the vapor on any other surfaces besides the substrate in column 10 lines 25-62.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al., Modisette et al. and Bondestram et al. to include a vaporization chamber maintained in a first hot zone, a reaction chamber maintained in a

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second hot zone where the two hot zones share some insulating elements as taught by Van Buskirk et al. in order to prevent condensation of the vapor on any other surfaces besides the substrate.

Claims 33 and 34 rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al., Modisette et al. and Bondestram et al. in view of US Patent number 6007330 to Gauthier. Murakami et al., Modisette et al. and Bondestram et al. are described above and include all the recitations of claims 33 and 34 except for a method to sense the level of unvaporized liquid in the vaporization chamber and automatically refill the unvaporized liquid. Gauthier teaches a method to sense the level of the unvaporized liquid and automatically refill the storage container and thereby refill the vaporization chamber to allow the system to run essentially continuously in column 5 lines 2-14.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Murakami et al., Modisette et al. and Bondestram et al. to include a method to sense the level of the unvaporized liquid and automatically refill the storage container and thereby refill the vaporization chamber as taught by Gauthier in order to allow the system to run essentially continuously.

(10) Response to Argument

Applicant's arguments filed 23 February 2009 have been fully considered but they are not persuasive.

The applicant argues that Murakami and Modisette do not teach draining unvaporized liquid from the vaporization chamber and returning the unvaporized liquid to the storage container. However, as was stated in the previous office actions, there are no structural differences between that of Murakami and the invention as claimed; therefore they are capable of performing the invention. Modisette further evidences this and gives motivation for using the valves and passages of Murakami in this manner, to recover and reuse valuable material (see below and previous office actions). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The applicant points out that Murakami uses a cold trap to trap the liquids and does not recycle them. However, a cold trap is merely a vessel which condenses and hence removes extra vapors from the system before they travel to and possibly damage the vacuum equipment that is evacuating the chamber. Hence Murakami already removes these vapors, and with the motivation provided in Modisette, along with any other motivation one of ordinary skill in the art would have to reuse materials such as economical reasons, producing less waste etc. this shows that in combination the references teach the features of the claim. A cold trap merely stores the unwanted vapors; it is certainly within the capabilities of one of ordinary skill in the art to recycle

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the stored vapors given the teachings of Murakami and Modisette. In addition, one of “a person of ordinary skill has good reason to pursue the known options with his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.” One of ordinary skill in the art would certainly find it within their technical grasp and known options to use the apparatus of Murakami as claimed especially in view of Modisette. Also, this claim limitation would have been obvious because the invention resulted from application of the prior knowledge in a predictable manner, i.e. Modisette as applied to the Murakami reference. See *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007). The applicant further alleges hindsight when combining these references because motivation is not present in Murakami as well as Modisette. However, in a 35 USC 103(a) rejection, motivation to combine may come from either reference and need not come from both. One of ordinary skill in the art would recognize the benefits to applying Modisette to Murakami by reading the Modisette reference as discussed above.

Therefore, for at least theses reasons, the rejections of the previous office action should be maintained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner’s answer.

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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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QAS, TC1700